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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/829,709	04/10/2001	David L. Anglin	08935-240001 / M-4931A	1782

26161 7590 12/02/2003

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BOSTON, MA 02110

EXAMINER
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MERCADO, JULIAN A

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 12/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/829,709

Applicant(s)

ANGLIN, DAVID L.

Examiner

Julian A. Mercado

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 September 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 3-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-38 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)                      4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)                      5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_                      6) ☐ Other:

Art Unit: 1745

## **DETAILED ACTION**

### ***Remarks***

This Office Action is responsive to applicant's amendment filed September 10, 2003.

The objected to the specification has been withdrawn.

The objection to claim 29 has been withdrawn.

This Office Action presents a new ground of rejection and is therefore made NON-FINAL.

### ***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 3-10, 16-19 and 30-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Friend (EP 0 962 997 A1) in view of Adams (U.S. Pat. 4,177,157).

Friend has been discussed in the prior Office Action. A reiteration will not be provided as the teachings of Friend have already been discussed in detail.

The examiner notes that applicant has amended the scope of independent claims 1 and 31 so as to recite carbon fibers present at 6% by weight. As set forth in the prior Office Action, Friend teaches the alleged inventive concept of carbon fibers in a manganese dioxide/alkaline battery having more than 5% of carbon fibers by weight, e.g. 5.15% by weight as employed in Example 1. (p. 7)

Art Unit: 1745

While Friend does not explicitly teach more than about 6% of the carbon fibers, Adams teaches graphite fibers at 10.5% by weight for a battery electrode. (col. 5 line 4) At the time the invention was made, it would have been obvious to one of ordinary skill in the art to employ carbon fibers at more than 6% by weight for reasons such as enhancing the level of conductivity of the electrode. (see Adams, col. 4 line 20 et seq.)

Claims 11, 12 and 35-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Friend in view of Adams as applied to claims 1, 3-10, 16-19 and 31-33 above, and further in view of Andersen (U.S. Pat. 4,948,484).

The teachings of Friend and Adams are set forth above.

Friend does not explicitly teach about 82% and about 92% of the cathode active material by weight, however, Andersen teaches that the cathode active material can range from 25% to 92% by weight. (col. 3 line 2-25, applies to independent claim 35 and dependent claims 11, 12, and 36-38) Thus, absent of unexpected results it is asserted that the weight percentage of the active material is an optimizable parameter for a result-effective variable. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) The skilled artisan would find obvious to optimize the weight percentage of the cathode active material as it directly affects the battery's discharge capacity. (col. 3 line 49-65)

Claims 13-15, 20-22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Friend in view of Adams as applied to claims 1, 3-10, 16-19 and 31-33 above, and further in view of Yagi (U.S. Pat. 4,923,637).

Art Unit: 1745

The teachings of Friend and Adams are set forth above.

Friend does not explicitly teach the claimed average diameter the carbon fibers.

However, Yagi teaches carbon fibers in a battery having an average diameter of 50 nanometers up to 2 microns with fibers specifically disclosed from 100 nanometers to 500 nanometers.(col. 4 line 1 and line 60-65, col. 11 line 7) The extent to which the disclosed ranges of carbon fibers in Yagi overlap with applicant's claimed ranges are relied upon to teach or at least suggest a diameter of "less than about 300 nanometers" (dependent claim 13), "between about 100 nanometers and about 250 nanometers (dependent claim 14), and "less than about 250 nanometers" (dependent claim 15). The skilled artisan would find obvious to further modify Friend's invention by employing the claimed diameter for the carbon fibers as Yagi discloses such carbon fiber diameters to have high conductivity and dispersibility into the applied resin, *inter alia*. (see Yagi, col. 2 line 25 et seq.)

While Friend discloses length to diameter ratios of at least 5, a length of 500 nm based on the disclosed diameters, Friend does not explicitly teach an average length of the carbon fibers. However, Yagi teaches carbon fibers in a battery having lengths of 10 to 1000  $\mu\text{m}$ , i.e. 10,000 to 1,000,000 nanometers. (col. 4 line 65) The extent to which the disclosed lengths of carbon fibers in Yagi overlap with applicant's claimed ranges (as well as consistently encompassing Friend's length of 500 nm) are relied upon to teach or at least suggest a carbon fiber length of "between about 500 nanometers and about 200,000 nanometers" (dependent claim 20), and "between about 70,000 nanometers and about 100,000 nanometers" (dependent claim 21). Additionally, the extent to which the resulting external surface area of the carbon fibers in Yagi based on the disclosed average length and diameter thereof is relied upon to teach or at least suggest the

Art Unit: 1745

claimed "external surface area between about  $10\text{m}^2/\text{g}$  and about  $50\text{m}^2/\text{g}$ . (applies to dependent claim 24). In Yagi, the carbon fiber has at least one layer of graphite, more so a plurality of layers of graphite. (col. 3 line 64, applies to dependent claim 22) For similar reasons in employing the claimed diameter of carbon fibers, the skilled artisan would find obvious to further modify Friend's invention by employing the claimed average length for the carbon fibers as Yagi carbon fibers of this length to allow for higher conductivity, *inter alia*. (ib)

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Friend in view of Adams and Yagi as applied to claims 13-15, 20-22 and 24 above, and further in view of Lafdi and Wright. (Carbon Fibers from Handbook of Composites, 1998)

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Friend in view of Adams as applied to claims 1, 3-10, 16-19 and 30-33 above, and further in view of Singer (U.S. Pat. 4,005,183)

Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Friend in view of Adams as applied to claims 1, 3-10, 16-19 and 30-33 above, and further in view of Lafdi and Wright and Singer.

As in the prior Office Action, the examiner maintains that for carbon fibers to have between about 40 to about 100 layers of graphite (dependent claim 23) or a graphitic index of less than about 85% (dependent claim 26) would be an optimizable parameter for result-effective variable. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) The number of layers of a carbon fiber are considered to be a result-effective variable as the "layer planes" of graphite crystallites directly effects the mechanical properties of the carbon fibers such as its tensile

Art Unit: 1745

modulus and tensile strength, *inter alia*. (Lafdi, p. 44 under “Effect of Graphite Structure on Fiber Properties”) The graphitic index is considered to be a result-effective variable as the graphite orientation of carbon fibers directly effects “graphitic-like” properties such as high density and low electrical resistance. (Singer, col. 11 line 43 to col. 14 line 53)

As to dependent claim 34, as to the electrical conductivity of the carbon fiber in the cathode (as claimed at more than 5% by weight) being at least 3 times greater than a cathode having about 6% of graphite by weight, the skilled artisan would find obvious that relative to non-fibrous graphite, carbon fibers have a higher degree of electrical conductivity. (Singer as cited above, Lafdi at p. 185 line 5 et seq.) As to the degree of conductivity being three times that of graphite, absent of unexpected results it is asserted that the degree of conductivity is an optimizable parameter for a result-effective variable such as for battery efficiency due to internal heat loss. *In re Boesch (ib)*

Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Friend in view of Adams as applied to claims 1, 3-10, 16-19 and 30-33 above, and further in view of Glasgow et al. (U.S. Pat. 6,506,355)

The teachings of Friend and Adams are set forth above. 1, 3-10, 16-19, 31, 32 and 33

Friend does not explicitly teach the carbon fibers to have a surface area between about  $10\text{m}^2/\text{g}$  and about  $50\text{m}^2/\text{g}$  (dependent claim 24) or a surface energy between about  $50\text{mJ}/\text{m}^2$  and about  $300\text{mJ}/\text{m}^2$  (dependent claim 25). However, the extent to which the disclosed ranges of surface area and surface energies in Glasgow overlap with applicant’s claimed ranges are relied upon to teach surface areas and surface energies for carbon fibers within this range. (col. 2 line

Art Unit: 1745

44 et seq., see also col. 1 line 60) Thus, the skilled artisan would find obvious to employ surface areas and surface energies within the instant range for reasons such as enhancing the adherence of the fibers within its compositional application.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Friend in view of Adams as applied to claims 1, 3-10, 16-19 and 30-33 above, and further in view of Mototani et al. (U.S. Pat. 5, 482,798)

The teachings of Friend and Adams are set forth above.

Friend does not explicitly teach the average length of the carbon fibers equal to or greater than the average particle size of the cathode active material. However, Mototani teaches that the average particle size of the active is preferably equal to the particle size of carbon. (col. 3 line 40-59, also see col. 1 line 37-45 in reference to a prior art disclosure) Thus, the skilled artisan would find obvious without undue experimentation to employ the carbon fiber length or particle size of Friend's invention equal to the particle size cathode active material in the battery. The motivation for such a modification would be to allow for optimal battery capacity and electrical conductivity.

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Friend in view of Adams as applied to claims 1, 3-10, 16-19 and 30-33 above, and further in view of Chalilpoyil et al. (U.S. Pat. 4,777,100)

The teachings of Friend and Adams are set forth above.



Art Unit: 1745

The examiner relies on Chalilpoyil as cited by applicant to teach a surfactant in the cathode. (col. 2 line 3-32) Thus, the skilled artisan would find obvious to employ a surfactant in the battery of Friend for reasons such as cell corrosion prevention.

Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Friend in view of Adams and Chalilpoyil et al. as applied to claim 28 above, and further in view of Callahan et al. (U.S. Pat. 6,287,730 B1)

The teachings of Friend, Adams and Chalilpoyil are set forth above.

Callahan is relied upon to teach a surfactant such as EVOH, i.e. ethylene vinyl alcohol. (col. 1 line 38-41)) The skilled artisan would find obvious to further modify Friend's invention by employing ethylene vinyl alcohol as a surfactant for reasons such as increasing the surface energies of the battery components (anode, cathode and separator, as disclosed in Kordesch and Chalilpoyil) and thereby further increasing anode metal particle affinity and enhancing the formed hydrogen gas inhibiting coating.

### ***Response to Arguments***

Applicant's arguments filed with the present amendment have been fully considered but are deemed moot in view of the new ground(s) of rejection.

Art Unit: 1745

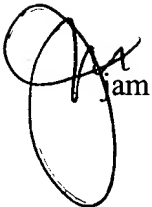
***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Julian A. Mercado whose telephone number is (703) 305-0511.

The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (703) 308-2383. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



Julian A. Mercado



Patrick Ryan  
Supervisory Patent Examiner  
Center 1700